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APPLICATION FOR UNITED STATES PATENT

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Title: OVEN DOOR LATCH ASSEMBLY INCLUDING FIXER

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SPECIFICATION

OVEN DOOR LATCH ASSEMBLY INCLUDING FIXER

Cross Reference to Related Applications

5 This patent application is a divisional of U.S. patent application serial
number 10/369,379 entitled "Oven Door Latch Assembly" filed February 19, 2003
which is fully incorporated by reference herein. U.S. patent application serial number
10/369,379 claims priority to provisional patent application serial no. 60/358,141 filed
February 20, 2002 entitled "Oven Door Latch Assembly" which is fully incorporated by
10 reference herein.

Field of The Invention

 This application relates to a motorized oven door latch assembly for
locking an oven door in a closed position when the oven is in a self-cleaning mode.

Background of the Invention

Self-cleaning ovens which are incorporated into self-standing ranges are well known. Such ovens conventionally have an oven door which is hingedly secured to a range body. The oven door may be opened to gain access to an oven cavity. The oven door may also be closed to close the opening for cooking objects placed in the cavity or cleaning the cavity. One or more heating elements reside in the oven cavity for cooking purposes.

Motorized latches which are used to lock oven doors in a closed position so that the oven cavity may be self cleaned are well known. U.S. Patent No. 3,859,979 and U.S. Patent No. RE. 27,545 and U.S. Patent No. 4,374,320 all disclose such motorized self-cleaning oven door latches. Such oven door latches are activated by a rotary motor located at the rearward portion of the range above the oven. Activation of the motor causes a rod to translate which causes a latch at the front of the rod to engage the oven door so that the oven door may not be opened. After the cleaning has occurred, the motor is reactivated, causing the latch at the front of the rod to disengage the oven door so that the oven door may be opened. Applicant's own U.S. Patent No. 6,302,098, which is fully incorporated by reference into this application, discloses another such oven door latch assembly.

One disadvantage with oven door latch assemblies having motors located spaced from the latch of the assembly is that during shipment the rod may bend or be otherwise damaged. In addition, the motor and/or associated electrical components such as switches may be damaged.

Another disadvantage with existing oven door latch assemblies having motors located spaced from the latch of the assembly is that upon arrival, the latch and/or motor assembly has moved during shipment. Consequently, the range

manufacturer has difficulty assembling the range because the latch is not in its correct position. The range manufacturer, not being familiar with the oven door latch assembly, may damage the oven door latch assembly during installation or install the oven door latch assembly incorrectly.

5 Therefore, it has further been an objective of the present invention to provide an oven door latch assembly which may be quickly and correctly installed by a range manufacturer.

 It has been another objective of the present invention to provide an oven door latch assembly which may be shipped more safely than heretofore possible.

10 Summary of the Invention

 The invention of this application which accomplishes these objectives comprises a motorized door latch assembly for locking an oven door in a closed and sealed position so as to close an oven cavity for purposes of cleaning the oven cavity. The oven door is hingedly mounted on a range body and moveable between an open
15 position, a closed position and a closed and sealed position.

 The door latch assembly comprises a mounting plate supported by the range body above the oven cavity and extending generally from front to back. However, the mounting plate may alternatively extend from side-to-side without departing from the spirit of this invention. Proximate the front of the mounting plate is a pin extending
20 upwardly from the mounting plate. The pin may be integrally formed with the mounting plate or a separate element secured to the mounting plate in any number of ways, including, but not limited to, being welded to the mounting plate.

 Proximate the rear of the mounting plate, a motor is supported by the range body. The motor is preferably located above and behind the range cavity but may

be located at any other location. The motor rotatively drives a cam, operatively associated with the motor.

A latch rod, having a pair of opposed ends, extends between the cam and a latch plate located at the front of the range. The latch rod has a first end secured to the rotatable cam and a second end secured to a latch plate. Rotation of the cam causes the latch rod to translate either forwardly or rearwardly. Other drivers, such as for example a solenoid, may be used in place of a motor assembly to cause the latch rod to translate.

The latch plate has a hook at one end for engaging the oven door and a hole at the other end. The second end of the latch rod passes through the hole of the latch plate and through a guide formed in the mounting plate so as to secure the second end of the latch rod to the latch plate and limit movement of the latch plate upon translation of the latch rod. The latch plate also has a slot therethrough in which the pin extending upwardly from mounting plate travels. The size of the slot and location of the pin restrict the movement of the latch plate so as to move the latch plate between three desired positions.

In operation, rotation of the cam by activation of the motor causes the latch rod to translate generally from back to front and causes the latch plate to move between three positions: a first position, a second position and a third position. In the first position, the latch plate is located such that the oven door may be opened. Upon translation of the latch rod, the latch plate moves to a second position in which the hook of the latch plate engages the oven door to prevent the oven door from being opened. In the third position, the latch plate is pulled inwardly by the latch rod, pulling the oven door into a locked and sealed position.

A biaser extends between a fixed point on the mounting plate and the latch plate so as to bias the latch plate toward the second position described

hereinabove. In the event of a failure while the oven is in a self-cleaning mode with the latch plate in its third position and the door locked and sealed, a user, using a pry bar tool may exert pressure on the hook of the latch plate causing the latch plate to rotate about the pin of the mounting plate toward the first position. With the latch plate pulled over to its first position the oven door may be opened without having to call a service technician.

To prevent damage to the latch assembly of the present invention during shipment, the latch plate may be locked or secured in its first position with a fixer which may be a pin, a bracket or a clamp. In one embodiment of the invention, a temporary length member may join two mounting plates to provide stability during shipment.

In two alternative embodiments of the invention, the rear mounting plate may be adjustably secured to the range body so that one size of latch assembly may be used with ranges of differing sizes.

The components of the latch assembly of the present invention may be shipped to an oven or range manufacturer in any number of parts, subassemblies or assemblies and assembled on site by the oven or range manufacturer. If the oven or range is larger or smaller than anticipated, the adjustability of the latch assembly of the present invention enables the latch assembly to be adjusted and properly installed. Similarly, if the latch assembly of the present invention initially does not fit inside the oven or range properly, the oven or range manufacturer may quickly and easily adjust the latch assembly of the present invention to fit properly.

Brief Description of the Drawings

FIG. 1 is a perspective of a self-standing range built in accordance with the present invention with a portion cut away.

FIG. 2 is an enlarged view of a portion of the front edge of the range of FIG. 1 with a pry bar-type tool illustrated being used to open the oven door.

FIG. 3 is a cross-sectional view taken on line 3-3 of FIG. 1, depicting the motorized oven door latch assembly of the present invention.

5 FIG. 4 is a cross-sectional view similar to FIG. 3 but illustrating a pry bar-type tool being used to open the range.

FIG. 5 is an enlarged view of a portion of the mounting plate of the motorized door assembly illustrating the configuration of the guide.

10 FIG. 6 is a plan view similar to FIG. 3 but illustrating an alternative embodiment of the latch assembly.

FIG. 6A is a cross-sectional view taken on line 6A-6A of FIG. 6.

FIG. 7 is a plan view similar to FIG. 3 but illustrating an alternative embodiment of latch assembly.

FIG. 7A is a cross-sectional view taken on line 7A-7A of FIG. 7.

15 FIG. 8 is a plan view similar to FIG. 3 but illustrating an alternative embodiment of latch assembly.

FIG. 8A is a cross-sectional view taken on line 8A-8A of FIG. 8.

FIG. 9 is a plan view similar to FIG. 3 but illustrating an alternative embodiment of latch assembly.

20 FIG. 10 is a plan view similar to FIG. 3 but illustrating an alternative embodiment of latch assembly.

FIG. 11 is a plan view similar to FIG. 3 but illustrating an alternative embodiment of latch assembly.

FIG. 11A is a cross-sectional view taken on line 11A-11A of FIG. 11.

Detailed Description of the Drawings

Referring to the drawings, and particularly to FIG. 1, there is illustrated a self-standing range 10 including a pyrolytic self-cleaning oven 12 on top of which are a plurality of burners 14 as is conventional. The range 10 comprises a range body 16 having a pair of side walls 18, a front wall 19, a back wall 20 (see FIG. 3) and a top 21. Spaced a fixed distance below the top 21 of the range body 16 is an oven top wall 22. An oven cavity 24 inside which resides one or more heating elements (not shown) is defined by the oven top wall 22, side walls 18 of the range body, a cavity back wall 25 and a bottom 27. An oven door 26 having a handle 28 and a window 30 is hingedly mounted to the front wall 19 of the range body so that a user pulling on the handle 28 will cause the oven door 26 to hingedly open about an horizontal axis 32 in order to move the door 26 between a closed position as shown in FIG. 1 and an open position. As best illustrated in FIGS. 2-4, the oven door 26 has a thickness T defined between a back wall 34 and a front wall 36 between which is insulation 38.

As best illustrated in FIGS. 2-4, a door latch assembly 40 functions to lock the oven door 26 in a closed and sealed position so that the oven door 26 may not be opened e.g. when the oven is in a self-cleaning mode. The door latch assembly 40 comprises multiple components which work together to move a latch plate 42, best illustrated in FIG. 2, between three different positions so that the oven door may be opened when the latch plate is in a first position and the oven door may not be opened when the latch plate is in either its second or third positions without a pry bar-type device or tool 43.

The door latch assembly 40 comprises a motor 44 activated by power lines 46 and located generally behind the rear wall 25 of the oven cavity 24. A cam 48

is secured to the motor 44 such that rotation of the motor causes the cam 48 to rotate about a vertical axis.

A mounting plate 50 extends generally from the back of the range to the front of the range and is secured to the front wall 19 of the range with fasteners 52 (see FIGS. 3 and 4). The mounting plate 50 is located below the top 21 of the range and above the top wall 22 of the oven cavity. An opening 54 in the mounting plate 50 allows the cam 48 to freely rotate when activated by the motor 44. The mounting plate 50 is supported by the range body above the oven cavity 24 in a generally horizontal orientation as seen in FIGS. 1 and 2. Although FIG. 1 illustrates the mounting plate 50 being located in a particular orientation, the mounting plate 50 may be placed in other locations as well without departing from the spirit of the invention of this application. As best illustrated in FIG. 2, the mounting plate 50 has a vertically oriented front lip 51. The front lip 51 abuts the front wall 19 of the range body and has a pair of holes therein 53 through which the fasteners 52 pass to secure the front lip 51 of the mounting plate 50 to the front wall 19 of the range body. Additionally, the front lip 51 of the mounting plate has a generally rectangular opening 55 through which the latch plate 42 passes.

As best illustrated in FIGS. 3, 4 and 5, a guide 57 is located at the front of the mounting plate 50. The guide 57 is an opening of a particular configuration illustrated in detail in FIG. 5 comprising a narrow front section 57a and a relatively wider back section 57b between which is located a middle section 57c. The size and configuration of the guide 57 limit the movement of the latch plate 42 in a manner described in more detail below.

As best illustrated in FIGS. 2-4, a latch rod 56 extends between the cam 48 and the latch plate 42, extending generally from front to back of the range. The latch rod 56 has a first end 58 which is secured to the cam 48 and a second end 60 which is

secured to the latch plate 42 in a manner which will be described in more detail below.

The latch rod 56 is located generally above the mounting plate 50 and moves in a linear manner depicted by the arrows 62 (shown in FIGS. 3 and 4) as the cam 48 rotates.

Another component of the door latch assembly 40 is the latch plate 42
5 best illustrated in FIG. 2. The latch plate 42 has a hook 64 located at a front end 66, and a hole 68 at a rear end 70. Between the front and back ends the latch plate 42 has a slot 72 therethrough adapted to receive a pin 74. The pin 74 is secured to the mounting plate 50 and extends upwardly therefrom in a fixed location. The pin 74 has a circular top portion 75 which prevents the latch plate 42 from being pulled out of position. The
10 top portion 75 of the pin 74 rests on top of the slot 72 of the latch plate 42, while the pin 74 travels inside the slot as the latch plate moves between positions.

As best illustrated in FIGS. 2 and 3, the latch plate 42 is movable between three positions: a first position 76, a second position 77 and a third position 78. The first position 76 of the latch plate 42 is shown in dashed lines in FIGS. 2 and 3
15 (to the left). In this first position, the hook 64 of the latch plate 42 is aligned with an opening 39 in the back wall 34 of the oven door (see FIGS. 2 and 3). With the latch plate 42 in this first position, the oven door 26 may be freely opened, the hook 64 of the latch plate 42 passing through the opening 39 in the oven door 26. As the latch rod 56 translates rearwardly due to activation of the motor and consequent rotation of the cam
20 48, the latch plate 46 moves to its second position, which is shown in dashed lines in FIG. 3. In this position, the oven door 26 may not be opened because the hook 64 of the latch plate 42 catches the back wall 34 of the oven door 26 in a manner depicted in FIG. 3. Upon further rearward translation of the latch rod 56, the latch plate 42 is pulled rearwardly in the direction of arrow 79 to its third position in which the oven door 26 is
25 locked and sealed. In this position, the oven door 26 is correctly sealed and seated so as

to provide a tight seal for the oven cleaning process. The third position of the latch plate 46 is shown in solid lines in FIGS. 2 and 3.

As best illustrated in FIG. 2, the second end 60 of the latch rod 56 comprises a vertical section 80 and a horizontal section 82 which terminates in an end 83. The hole 68 in the latch plate 42 is sized so as to have a diameter slightly larger than the diameter of the vertical section 80 of the latch rod 56 so that the vertical section 80 of the latch rod 56 passes through the hole 68 in the latch plate 46 and through the guide 57 in the mounting plate 50 with the horizontal section 82 of the latch rod 56 being located below the mounting plate 50. The horizontal section 82 of the latch rod 56 prevents the latch rod 56 from separating from either the latch plate 42 or the mounting plate 50 as the vertical section 80 of the latch rod 56 moves inside the guide 57 upon translation of the latch rod 56.

In order to bias the latch plate 42 toward its second position, a biaser 85 (best illustrated in FIG. 2) extends between a bracket 87 fixedly secured to the front of the mounting plate 50 and a finger 89 of the latch plate 42. The finger 89 of the latch plate extends vertically and has a hole 90 therein through which a hook 91 of the biaser 85 passes in order to secure one end of the biaser 85 to the latch plate. The other end of the biaser 85 has a hook 93 which passes through a hole 94 in the bracket 87. Although the biaser 85 is illustrated as being a spring, the biaser 85 may be any other biasing-type mechanism and may be secured at either end with structures other than hooks to the latch plate 42 and to the bracket 87, respectively.

In operation, upon activation of the motor, the cam 48 rotates, causing the latch rod 56 to translate along the direction of arrows 62. Upon rearward translation of the latch rod 56, the latch plate 42 moves from its first position 76 to its second position 77 in which the oven door is prevented from opening. Upon further translation

of the latch rod, the latch plate is pulled rearwardly to its third position 78 in which the oven door 26 is in a locked and sealed position with the back wall 34 of the oven door exerting pressure against a gasket 96 located between the oven door 26 and the front wall 19 of the range body (see FIGS. 2 and 3).

5 In the event of an electrical or mechanical failure while the oven is in a self-cleaning mode and the oven door 26 is in a locked and sealed position, the latch rod 56 will not translate. Thus, the latch plate 42 is fixed in its third position. In heretofore known range door assemblies, a service technician had to be called in order to access the latch rod 56 through the back of the range in order to open the oven door 26 so that
10 the oven could be used for cooking. With the present invention, a pry bar-type device or tool 43 having a horizontal section 98 and a vertical section 100 may be used to open the oven door 26 without having to call a service technician and without having to access the oven cavity through the rear panel of the range.

 As best illustrated in FIGS. 2 and 4, the vertical section 100 of the pry
15 bar tool 43 is moved in the direction of arrow 102 such that the vertical section 100 is pried between the oven door 26 and the front wall 19 of the range body to the right of the latch plate. By moving the tool 43 in the direction of arrow 104, as shown in FIG. 4, pressure is exerted on the latch plate, pushing the front end of the latch plate in the direction of arrow 106 (to the left), as seen in FIGS. 2 and 4, towards its first position.
20 By moving the pry bar tool 43 in this direction, the latch plate 42 is moved against the bias of the biaser 85 causing the rear of the latch plate 42 to move in a forward and sideways direction as dictated by the configuration of the guide 57 formed in the mounting plate 50. As best illustrated in FIG. 4, the latch plate 42 rotates and slides about the pin 74 and the pin moves inside the slot 72 so that the latch plate 46 is moved

to its first position. With the latch plate 42 in its first position 76, the oven door 26 may be opened.

FIGS. 6 and 6A illustrate one alternative embodiment of the motorized door latch assembly of the present invention prepared for shipment. The latch plate 42a is fixed in its first position by a fixer to prevent movement of the latch plate 42a during shipment. In this embodiment of the invention, the fixer is a pin 110 which extends through the mounting plate 50a and latch plate 42a, as shown in FIG. 6A. The pin 110 may be made of plastic or soft metal such as aluminum and may have perforations therethrough. Upon arrival at the range manufacturing facility, the range manufacturer may shear the pin 110 in half or break the pin by activating the motor or driver 44. After the pin 110 has been either broken in half or otherwise removed, the latch plate 42a is free to move between its positions in a manner described hereinabove.

FIGS. 7 and 7A illustrate another embodiment of the motorized door latch assembly of the present invention prepared for shipment. The latch plate 42b is fixed in its first position by a fixer to prevent movement of the latch plate 42b during shipment. In this embodiment of the invention, the fixer is an L-shaped member 112 which engages two extensions 114 of the latch plate 42b. The L-shaped member 112 is secured to the mounting plate 50b and extends upwardly therefrom. See FIG. 7A. The L-shaped member 112 may be made of plastic or soft metal such as aluminum. Upon arrival at the manufacturing facility, the range manufacturer may shear or break the L-shaped member 112 by activating the motor or driver 44. Alternatively, the L-shaped member 112 may be manually or otherwise removed. After the L-shaped member 112 has been either broken or otherwise removed, the latch plate 42b is free to move between its positions in a manner described hereinabove.

FIGS. 8 and 8A illustrate another embodiment of the motorized door latch assembly of the present invention prepared for shipment. The latch plate 42c is fixed in its first position by a fixer to prevent movement of the latch plate 42c during shipment. In this embodiment of the invention, the fixer is an C-shaped clip 116 which engages the pin 74 extending upwardly from the mounting plate 50c. The C-shaped clip 116 surrounds the pin 74 above the latch plate 42c. See FIG. 8A. Alternatively, the C-shaped clip 116 may be located underneath the latch plate 42c. The C-shaped clip 116 may be made of plastic or soft metal such as aluminum. Upon arrival at its destination, the range manufacturer may shear or break the C-shaped clip 116 by activating the motor or driver. Alternatively, the range manufacturer may manually remove the C-shaped clip 116. After the C-shaped clip 116 has been either broken or otherwise removed, the latch plate 42c is free to move between its positions in a manner described hereinabove.

FIG. 9 illustrates an alternative embodiment of the present invention. This embodiment utilizes two mounting plates, a rear mounting plate 118 to which the motor 44 is secured at the rear of the range and a front mounting plate 120 to which the latch plate 42d is secured at the front of the range. Thus this embodiment of the present invention eliminates the middle section of the mounting plate of the other embodiments, thereby reducing the manufacturing cost of the latch assembly. During shipment a temporary length member 122 is secured with fasteners 123 to the front and rear mounting plates 120, 118, respectively. The temporary length member 122 gives the entire latch assembly greater strength to help prevent the latch rod 56 from being bent or otherwise damaged during shipment. Upon arrival at the manufacturing facility, the range manufacturer may remove the temporary length member 122 by removing fasteners 123.

FIGS. 10 and 11 illustrate alternative embodiments of the present invention in which two mounting plates are secured to the range body. In each of these embodiments, the rear mounting plate is adjustably secured to the range body to accommodate ranges of different sizes. The front mounting plate is stationary. In the embodiment illustrated in FIG. 10, the rear mounting plate 124 has a plurality of holes 126 therethrough which line up with two holes in the range body 16. The rear mounting plate 124 may be secured to the range body using two fasteners 128 passing through these holes. Regardless of the size of the range, one size of latch assembly may be used in this embodiment of the present invention due to the adjustability of the rear mounting plate 124.

In the embodiment illustrated in FIGS. 11 and 11A, the rear mounting plate 130 has a series of wave-like serrations 132 which align with a series of wave-like serrations 134 in a top plate 135. A fastener 136 passes through a hole 140 in the top plate 135, a slot 144 in the rear mounting plate 130 and a hole 142 in the range body 16. By adjusting the rear mounting plate 130 relative to the range body 16, the same latch plate assembly may be used with different size ranges. Alternatively, more than one fastener may be used.

Thus, with the present invention an operator may quickly and easily open the oven door even in the event of a mechanical or electrical failure. Consequently, the oven may be used for cooking immediately and is not inoperable for an extended period of time (until a service technician comes to fix the cause of the failure).

While we have described one preferred embodiment of the present invention, persons skilled in the art will appreciate changes and modifications which may be made to the present invention without departing from the scope of the invention. Therefore, we do not intend to be limited except by the scope of the following claims.